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THE STATUS OF *CASTILLEJA TOMENTOSA* A. GRAY (OROBANCHACEAE) AND FIRST RECORDS FOR THIS SPECIES FROM THE UNITED STATES

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ABSTRACT

Castilleja tomentosa A. Gray, described from Sonora, Mexico, appears to be a bona fide species readily distinguished from several morphologically similar and presumably related *Castilleja* species of the southwestern USA and northwestern Mexico. First records of this rare species for the USA are presented, along with a key and photographs for separating it from species with which it might be confused. Comments on its conservation status are provided.

KEY WORDS: Orobanchaceae, *Castilleja integra*, *Castilleja lanata*, *Castilleja stenophylla*, *Castilleja tomentosa*, endangered species, rare species, Animas Valley, Hidalgo County, Sonora

Castilleja tomentosa A. Gray was first published in 1859 in the Botany of the Boundary Survey (A. Gray 1858), wherein Gray also described *Castilleja lanata* A. Gray and *Castilleja integra* A. Gray, two of the three species of the inland southwestern United States and northwestern Mexico with which it might be confused. The third is *Castilleja stenophylla* M.E. Jones, a species of northwestern Mexico described much later (Jones 1908). Aside from the Latin diagnosis, Gray remarked in the protologue that *C. tomentosa* was distinguished from *C. lanata* and from the Californian species *Castilleja foliolosa* Hook. & Arn. by its pubescence, with "the wool less dense and floccose than in *C. lanata*" and in the calyx being "… different, and apparently fully as long as the galea." In the Latin diagnosis, Gray mentioned several features key to its identification, "...floralibus (=bracts) trifidis superne coloratis..." and "calycis sunequaliter bifidi lobis semibifidid lanceolatis acutis...." Gray based his description of *C. tomentosa* on two herbarium sheets from a single collection obtained by George Thurber on "dry hillsides" near Mabibi, Sonora in June 1851. Mabibi is a small community located in the eastern Sierra Madre Occidental in northeastern Sonora about 40 km south of the USA-Mexico border. Four years later Gray (1862) changed his mind and reduced *C. tomentosa* to synonymy under *C. integra*, noting that the later should include "my *C. tomentosa*, from Mabibi, Arizona (sic), Thurber, appears to be a more tomentose state of the same species, the flowers of the specimen not well developed." While Gray was correct in rejecting his original diagnosis of the calyces being "apparently fully as long as the galea," he missed completely an important and consistent difference between *C. tomentosa* and *C. integra*, the characteristics of the distal leaves and especially the floral bracts.

Following Gray's reduction of *Castilleja tomentosa* to synonymy under *C. integra*, this entity and Thurber's collection of it were almost completely forgotten in the botanical literature or were routinely listed or annotated in synonymy, as in Eastwood's revision of *Castilleja* in Mexican (1909). T.I. Chuang (1993-1994) annotated the GH sheets of Thurber 438 as *C. lanata*, which is clearly incorrect in the structure of the calyces alone. G.L. Nesom, who worked with Mexican *Castilleja* species in the early 1990's, was undecided about *C. tomentosa* and annotated the holotype (1992) only with the type name, not referring it to another species. Boufford and Nesom (1993) designated the holotype (Fig. 1) and an isotype for *C. tomentosa*, based on the two sheets of *Thurber 438* at GH. Neither in this paper nor in Nesom's several subsequent papers on Mexican *Castilleja* species was the

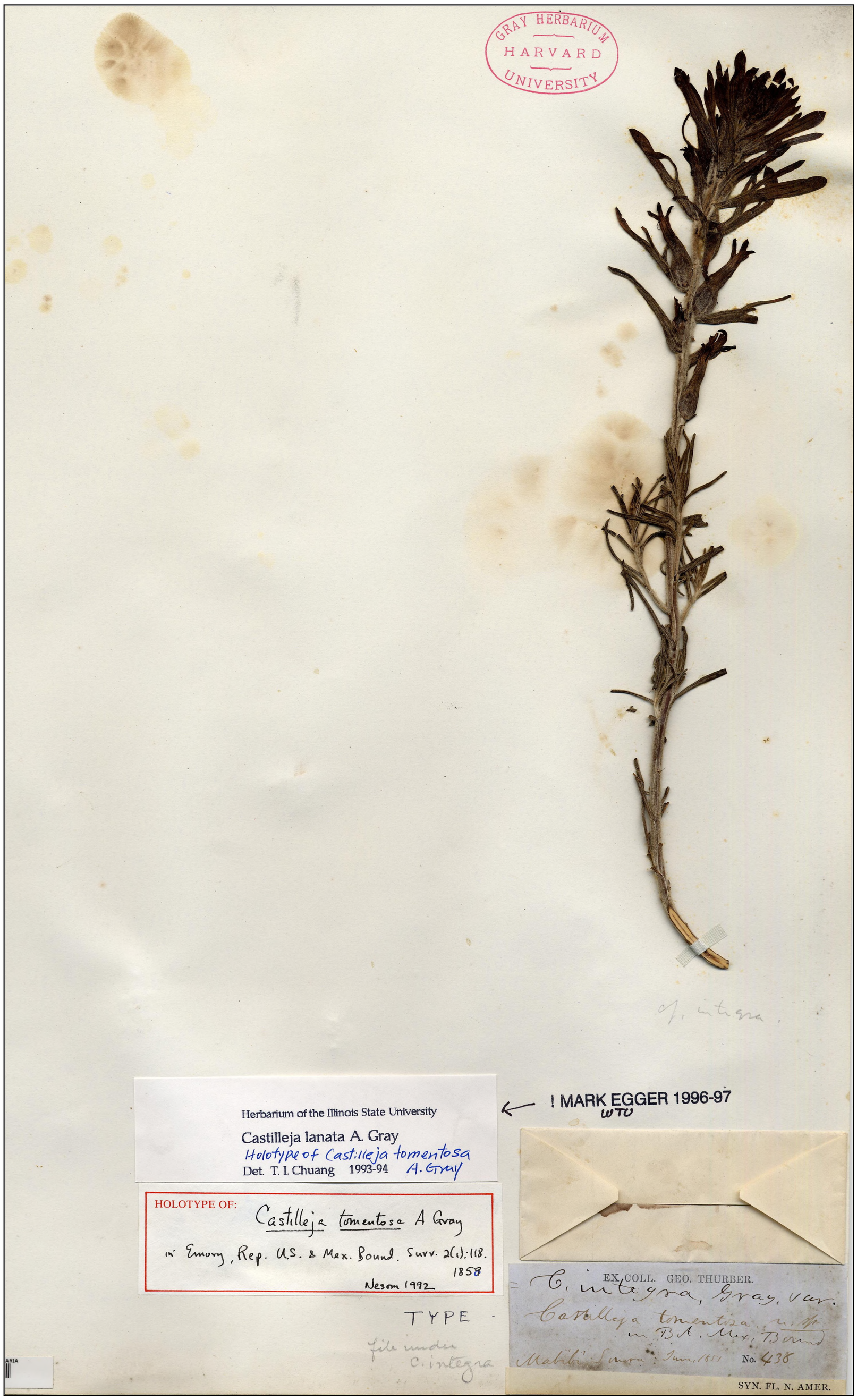

Figure 1. Holotype of *Castilleja tomentosa* A. Gray, GH. My annotation agreeing with the identification of the specimen as *C. lanata* from 1996-1997 is incorrect.

identity of *C. tomentosa* discussed in print. However, in a personal communication to me in the late 1990's Nesom mentioned that the type material of *C. tomentosa* seemed very close to *C. stenophylla*.

On 26 August 1994, while conducting fieldwork in the Animas Valley of Hidalgo Co., New Mexico, I encountered several plants of an unusual *Castilleja* near the headquarters building of the Animas Ranch. I documented these plants with photos and a unicate collection (*Egger 677*, WTU, Fig. 2), but I dismissed them at the time as variant *C. integra*. Though I continued to wonder about this population for a number of years, I did not pursue the matter further, likely since I had not yet seen any material from the type collection of *C. tomentosa*.

Then, starting around 2007, I became involved in the writing of a *Castilleja* treatment for the Flora of the Four Corners Region, Vascular Plants of the San Juan River Drainage. (in press) and corresponded with Ken Heil of SJNM, the editor and a primary author of the flora. He brought my attention to a collection of *C. tomentosa* he made in 1997 (*Heil 11,249* SJNM). Eventually, I compared this and later collections by Heil and associates with the type of *C. tomentosa* and realized their congruity as well as the fact that they also matched the characters of the plants I encountered in 1994 (Fig. 3).

Figure 2. *Castilleja tomentosa*, *Egger 667*, WTU, live plants and specimens, first USA collection.

Conservation status

Castilleja tomentosa is only known from the type locality in Mexico and from four collection sites in and near the Animas Valley in southern Hidalgo Co., New Mexico, in the USA. The known collection sites are all within 40-50 straight-line km of each other. I have not conducted an

exhaustive search of southwestern herbaria for mislabeled specimens, though there may well be such collections to be identified. In any case, *C. tomentosa* should be regarded as a globally endangered species, at least until further research can be conducted to evaluate its true abundance. It is also interesting to note that *C. tomentosa* closely shares the distribution of another very rare *Castilleja* species, *C. ornata* Eastw., which is also known only from a handful of sites in Mexico and from small populations in the southern Animas Valley, New Mexico (McIntosh, 1994), and which is similarly endangered.

Figure 3. Isotype of *Castilleja tomentosa* A. Gray, NY (L); *C. tomentosa*, Egger 667, WTU (R).

Verified collections of *Castilleja tomentosa*

MEXICO: **Sonora**. Dry hillside, Mabibi, Jun 1851, *Thurber 438* (holotype: GH!; isotypes: F!, GH!, NY!). **USA**: **New Mexico**. Hidalgo Co.: Animas Valley, dry, grassy meadow along NM Hwy 338, ca. 1/4 mi. S of Animas Ranch headquarters, 26 Aug 1994, *Egger 677* (WTU); North of Fitzpatrick's Ranch House, Gray Ranch, Alkali sacaton community; 31°21.354' N, 108°51.928' W, T32S, R20W, S.27, SE1/4, SW1/4, 4990', 7 Aug 1997, *Heil 11,294* (SJNM); Diamond A Ranch (Gray Ranch), 0.7 mi. SW of Fitzpatrick's Camp, 31°23.479' N, 108°52.040' W, 5220', 30 Jul 2010, *Heil & O'Kane 32664* (GH, SJNM, TEX, US, WTU[2]); Clanton Draw Road, side road just W of Forest Service boundary, 31.52630° N, 108.9774° W, 5430', 16 Sep 2010, *Heil & Penn 33070* (SJNM, WTU).

Identificaton of *Castilleja tomentosa*

Castilleja tomentosa is readily separated from other similar *Castilleja* species of the region in which it occurs by the following key. A visual guide to representative live specimens of each species addressed in the keys is also presented below (Figs. 4–7). A full description of *C. tomentosa* will be provided in the *Castilleja* treatment in the Flora of North America (in prep).

A key to the *Castilleja* species of southern Arizona and New Mexico and adjacent Sonora and Chihuahua having lanate to tomentose stems

1. Bracts usually entire to less often with one pair of short, lanceolate lateral lobes, almost always originating from the middle of the blade or above; bracts proximally greenish.

2. Bracts almost always entire, clearly lanceolate and distally acute; leaves usually linear and strongly differentiated from the bracts; not known to occur north of the Mexican border ..... **Castilleja stenophylla**

2. Bracts usually entire and distally broadly rounded but often some with a pair of short, lanceolate lateral lobes; leaves linear to linear-lanceolate and not as strongly differentiated from the floral bracts; common in appropriate habitats north of the USA-Mexico border, extending into extreme NE Sonora and northern Chihuahua, Mexico ..... **Castilleja integra**

1. Bracts usually deeply divided with one pair of much longer, narrowly oblanceolate to less often lanceolate to linear-lanceolate lobes, usually originating from well below the middle of the blade; bracts proximally grey-green to greenish tinged with pale root-beer brown.

3. Primary lobes of calyces entire and rounded, emarginate, or shallowly cleft into obtuse to rounded lobes; stem pubescence usually densely lanate, with branched or unbranched hairs ..... **Castilleja lanata**

3. Primary lobes of calyces much more deeply cleft into linear-lanceolate secondary lobes; stem pubescence usually less dense and tomentose with unbranched hairs ..... **Castilleja tomentosa**

Figure 4. *Castilleja stenophylla*. Woodland shade form, Sierra La Raspadura, Chihuahua, Mexico, 18 Aug 1998, *Egger 1050* (L); open meadow form, SW of La Junta, Chihuahua, Mexico, 18 Aug 1998, *Egger 1044* (R).

Figure 5. *Castilleja integra*. Form with entire bracts, NW of Flagstaff, Coconino Co., Arizona, 27 Aug 1994, *Egger 674* (L); form with lobed bracts, near Elizabethtown, Colfax Co., NM, 31 Jul 2001, *Egger 1173* (R)

Figure 6. *Castilleja lanata*. E of Van Horn, Pecos Co., Texas, 19 Apr 1997, *Egger 842*.

Figure 7. *Castilleja tomentosa*. Mature plant, near Animas Ranch Headquarters, Animas Valley, Hidalgo Co., New Mexico, 26 Aug 1994, *Egger 677* (L); young plant and different color form, SW of Fitzpatrick's Camp, Animas Valley, Hidalgo Co., New Mexico, 30 Jul 2010, *Heil & O'Kane 32664* (R).

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